We Claim:

1. A catalyst system comprising a catalyst and a support comprising a non-layered inorganic porous crystalline phase material, wherein the support comprises a hexagonal arrangement of uniformly-sized pores having an average pore diameter greater than or equal to about 13Å, an X-ray diffraction pattern having a calculated d_{100} value of greater than or equal to about 18Å, an adsorption capacity of greater than or equal to about 15 grams benzene per 100 grams support at 50 torr and at 25°C, and a pore wall thickness of less then or equal to about 25Å.

2. The catalyst system of claim 1, wherein the catalyst system is calcined at greater than or equal to about 200°C for greater than or equal to about 5 minutes in the presence of an oxidizing gas.

3. The catalyst system of claim 1, wherein the catalyst system is calcined at about 500°C to about 750°C for about 30 minutes to about 10 hours in air.

4. The catalyst system of claim 1, wherein greater than or equal to about 80% of the pores have a pore diameter plus or minus about 20% the average pore diameter of the support.

5. The catalyst system of claim 1, wherein greater than or equal to about 90% of the pores present have a pore diameter plus or minus about 5% the average pore diameter of the support.

6. The catalyst system of claim 1, wherein the average pore diameter of the support is about 20Å to about 500Å.

7. The catalyst system of claim 1, wherein the average pore diameter of the support is about 70Å to about 90Å.

8. The catalyst system of claim 1 having a surface area greater than or equal to about 300 m^2/g support.

9. The catalyst system of claim 1, wherein the pore wall thickness is less than or equal to about 20Å.

10. The catalyst system of claim 9, wherein the pore wall thickness is greater than or equal to about 4Å.

11. The catalyst system of claim 1, wherein said crystalline phase material has a composition expressed as follows:

$$M_{n/q} (W_a X_b Y_c Z_d O_h)$$

where M is one or more ions;
n is the charge excluding M expressed as oxides;
q is the weighted molar average valence of M;
n/q is the number of moles or mole fraction of M;
W is one or more divalent elements;
X is one or more trivalent elements;
Y is one or more tetravalent elements;
Z is one or more pentavalent elements;
O is oxygen;
a, b, c, and d are mole fractions of W, X, Y, and Z, respectively;
h is a number of from 1 to 2.5; and
(a+b+c+d)=1.

12. The catalyst system of claim 11, wherein a and d are 0 and h=2.

13. The catalyst system of claim 12, wherein X comprises aluminum and Y comprises silicon.

14. The catalyst system of claim 13, where the support comprises about 0.1 to about 20 weight percent alumina, based on the total weight of the support.

15. The catalyst system of claim 1 having an average particle size greater than or equal to about 1 micrometer.

16. A catalyst system comprising a catalyst and a support comprising a non-layered inorganic porous crystalline phase material calcined at greater than or equal to about 200°C for greater than or equal to about 1 minute in the presence of an oxidizing gas, wherein the support comprises a hexagonal arrangement of uniformly-sized pores having an average pore diameter greater than or equal to about 13Å, an X-ray diffraction pattern having a calculated d_{100} value of greater than or equal to about 18Å, an adsorption capacity of greater than or equal to about 15 grams benzene per 100 grams support at 50 torr and at 25°C, and a pore wall thickness of less then or equal to about 25Å.

17. The catalyst system of claim 16, wherein the catalyst comprises a Group 6 metal.

18. The catalyst system of claim 16, wherein the catalyst comprises chromium.

19. The catalyst system of claim 16, wherein the pores of the support are arranged within the support such that a surface of the pores define an inner surface of the support located internal to an outer surface of the support, and wherein an amount of the catalyst on the inner surface of the support is greater than an amount of the catalyst on the

outer surface of the support, as determined by comparing the catalyst concentration on essentially the surface of the catalyst system, with the catalyst concentration of an amount of the catalyst system which has been crushed.

20. The catalyst system of claim 16, wherein the catalyst system is calcined at about 500°C to about 900°C for about 0.5 to about 10 hours in the presence of air.

21. The catalyst system of claim 16, wherein greater than or equal to about 80% of the pores have a pore diameter plus or minus about 20% the average pore diameter of the support.

22. The catalyst system of claim 16, wherein greater than or equal to about 90% of the pores present have a pore diameter plus or minus about 5% the average pore diameter of the support.

23. The catalyst system of claim 16, wherein the average pore diameter of the support is about 20Å to about 500Å.

24. The catalyst system of claim 16, wherein the average pore diameter of the support is about 70Å to about 90Å.

25. The catalyst system of claim 16 having a surface area greater than or equal to about 300 m^2/g support.

26. The catalyst system of claim 16, wherein the pore wall thickness is less than or equal to about 20Å.

27. The catalyst system of claim 25, wherein the pore wall thickness is greater than or equal to about 4Å.

28. The catalyst system of claim 16, wherein said crystalline phase material has a composition expressed as follows:

$$M_{n/q} (W_a X_b Y_c Z_d O_h)$$

where M is one or more ions; n is the charge excluding M expressed as oxides;
q is the weighted molar average valence of M;
n/q is the number of moles or mole fraction of M;
W is one or more divalent elements;
X is one or more trivalent elements;
Y is one or more tetravalent elements;
Z is one or more pentavalent elements;
O is oxygen;
a, b, c, and d are mole fractions of W, X, Y, and Z, respectively;
h is a number of from 1 to 2.5; and
(a+b+c+d)=1.

29. The catalyst system of claim 28, wherein a and d are 0 and h=2.

30. The catalyst system of claim 29, wherein X comprises aluminum and Y comprises silicon.

31. The catalyst system of claim 30, comprising about 0.1 to about 20 weight percent alumina, based on the total weight of the support.

32. The catalyst system of claim 16 having an average particle size greater than or equal to about 1 micrometer.

33. The catalyst system of claim 16, comprising about 0.01 to about 10 weight percent catalyst, based on the total weight of the catalyst system.

34. A process to prepare the catalyst system of claim 16, comprising

contacting a solution comprising a catalyst precursor with an amount of the support, wherein the solution comprises an amount of solvent less than or equal to about twice the total pore volume of the amount of the support;

removing the solvent from the support; and

calcining the support at greater than or equal to about 200°C for greater than or equal to about 1 minute in the presence of an oxidizing gas to produce the catalyst system.

35. The process of claim 34, wherein the catalyst precursor comprises chromium.

36. The process of claim 16, wherein the catalyst precursor comprises chromic acetate, chromic bromide, chromic carbonate, chromic chloride, chromic fluoride, chromic formate, chromic hydroxide, chromic nitrate, chromic oxide, chromic phosphate, chromic potassium sulfate, chromic sulfate, chromium metal, chromium carbonyl, chromium dioxide, chromium picolinate, chromium tetrafluoride, chromium trioxide, chromium acetylacetonate, chromous acetate, chromous bromide, chromous chloride, chromous fluoride, chromous formate, chromous oxalate, chromous sulfate, chromyl chloride, chromyl fluoride, or a combination comprising at least one of the foregoing.

37. A process to polymerize an unsaturated monomer, comprising:

contacting the monomer with a catalyst system and optionally a scavenger, wherein the catalyst system comprises a catalyst and a support comprising a non-layered inorganic porous crystalline phase material calcined at greater than or equal to about 200°C for greater than or equal to about 1 minute in the presence of an oxidizing gas, wherein the support comprises a hexagonal arrangement of uniformly-sized pores having an average pore diameter greater than or equal to about 13Å, an X-ray diffraction pattern

having a calculated d_{100} value of greater than or equal to about 18Å, an adsorption capacity of greater than or equal to about 15 grams benzene per 100 grams support at 50 torr and at 25°C, and a pore wall thickness of less then or equal to about 25Å.

38. The process of claim 37, wherein an induction time between contacting of the monomer with the catalyst system, and the onset of polymerization, is less than or equal to about 2 minutes for ethylene polymerization at about 100°C to about 110°C, and about 450 psig to about 500 psig.

39. The process of claim 37, wherein the catalytic system has an activity of greater than or equal to about 800 g/g/hr for ethylene polymerization, wherein the ethylene polymerization is conducted at about 100°C to about 110°C, and about 450 psig to about 500 psig.

40. The process of claim 37, wherein the monomer includes C_2-C_{60} olefins, C_2-C_{20} alpha olefins, or a combination comprising at least one of the foregoing.

41. The process of claim 37, carried out under slurry phase polymerization conditions.

42. The process of claim 37, carried out under gas phase polymerization conditions.

43. The process of claim 37, carried out under bulk phase polymerization conditions.

44. The process of claim 37, wherein the catalyst comprises a Group 6 metal.

45. The process of claim 37, wherein the catalyst comprises chromium.

46. The process of claim 37, wherein the pores of the support are arranged within the support such that a surface of the pores define an inner surface of the support located internal to an outer surface of the support, and wherein an amount of the catalyst on the inner surface of the support is greater than an amount of the catalyst on the outer surface of the support, as determined by comparing the catalyst concentration on essentially the surface of an amount of the catalyst system, with the catalyst concentration of an amount of the catalyst system which has been crushed.

47. The process of claim 37, wherein the support is calcined at about 500°C to about 750°C for about 0.5 to about 10 hours in air.

48. The process of claim 37, wherein greater than or equal to about 80% of the pores have a pore diameter plus or minus about 20% the average pore diameter of the support.

49. The process of claim 37, wherein greater than or equal to about 90% of the pores present have a pore diameter plus or minus about 5% the average pore diameter of the support.

50. The process of claim 37, wherein the average pore diameter of the support is about 20Å to about 500Å.

51. The process of claim 37, wherein the average pore diameter of the support is about 70Å to about 90Å.

52. The process of claim 37, having a surface area greater than or equal to about 300 m^2/g support.

53. The process of claim 37, wherein the pore wall thickness is less than or equal to about 20Å.

54. The process of claim 52, wherein the pore wall thickness is greater than or equal to about 4Å.

55. The process of claim 37, wherein said crystalline phase material has a composition expressed as follows:

$$M_{n/q} (W_a X_b Y_c Z_d O_h)$$

where M is one or more ions; n is the charge excluding M expressed as oxides;
q is the weighted molar average valence of M;
n/q is the number of moles or mole fraction of M;
W is one or more divalent elements;
X is one or more trivalent elements;
Y is one or more tetravalent elements;
Z is one or more pentavalent elements;
O is oxygen;
a, b, c, and d are mole fractions of W, X, Y, and Z, respectively;
h is a number of from 1 to 2.5; and
(a+b+c+d)=1.

56. The process of claim 55, wherein a and d are 0 and h=2.

57. The process of claim 56, wherein X comprises aluminum and Y comprises silicon.

58. The process of claim 57, comprising about 0.1 to about 20 weight percent alumina, based on the total weight of the support.

59. The process of claim 37 having an average particle size greater than or equal to about 1 micrometer.

60. The process of claim 37, comprising about 0.01 to about 10 weight percent catalyst, based on the total weight of the catalyst system.

61. The polymer produced according to the process of claim 37, wherein the polymer comprises polyethylene.

62. The polymer of claim 61 having a density of greater than or equal to about 0.9 grams per cubic centimeter.

63. A catalyst system comprising a catalyst and MCM-41.